CLAIMS

What is claimed is

Sub a1

1. A near field optical apparatus comprising a conductive plane having an aperture therein, said conductive plane having at least one protrusion extending into said aperture.

2. The near field apparatus of claim 1, wherein said protrusion defines first and second regions in said aperture, said protrusion located between said first and second regions.

3. The near field apparatus of claim 2, wherein said first and second regions are elongated in a direction which is substantially parallel with a polarization direction of a light source.

4. The near field optical apparatus of claim 1, wherein said aperture has a perimeter dimension which is substantially resonant with an output wavelength of light passing through said aperture.

5. The near field optical apparatus of claim 1, wherein said conductive plane includes first and second protrusions extending into said aperture, said first and second protrusions located on substantially opposite sides of said aperture.

6. The near field optical apparatus of claim 3, wherein said first region comprises a first slot, said second region comprises a second slot, and said protrusion further defines a connecting region joined to said first and second slots.

7. The near field optical apparatus of claim 1, wherein said protrusion is electrically isolated from said conducting plane.

8. The near field optical apparatus of claim 5, wherein said first and second protrusions are electrically isolated from said conducting plane.

9. A near field optical apparatus, comprising:

(a) a light source;

(b) a conductive plane associated with said light source, said conductive plane having an aperture therein positioned such that light from said light source passes through said aperture;

(c) said conductive plane including at least one protrusion which extends into said aperture.

10. The near field apparatus of claim 9, wherein said protrusion defines first and second regions in said aperture, and a localization aperture located between said first and second regions proximate said protrusion.

11. The near field apparatus of claim 10, wherein said first and second regions are elongated in a direction which is substantially parallel with a direction of polarization of said light source.

12. The near field optical apparatus of claim 9, wherein said aperture has a perimeter dimension which is substantially resonant with an output wavelength of said light source.

13. The near field optical apparatus of claim 9, wherein said conductive plane includes first and second protrusions extending into said aperture, said first and second protrusions located on substantially opposite sides of said aperture.

14. The near field optical apparatus of claim 11, wherein said first region comprises a first slot, said second region comprises a second slot, and said protrusion further defines a connecting region joined to said first and second slots, said connecting region defining a localization aperture.

15. The near field optical apparatus of claim 9, wherein said protrusion is electrically isolated from said conducting plane.

16. The near field optical apparatus of claim 13, wherein said first and second protrusions are electrically isolated from said conducting plane.

Sub a3

17. The near field optical apparatus of claim 9, wherein said light source is a semiconductor laser, and said conductive plane is a metal layer associated with an emission facet of said semiconductor laser.

18. The near-field apparatus of claim 17, wherein said semiconductor laser further comprises:

(a) a laser active region;

(b) a first reflective region adjacent a first side of said active region; and

(c) a second reflective region adjacent a second side of said active region;

(d) said metal layer positioned adjacent an outer surface of said first reflective region.

Sub a4

19. A semiconductor laser apparatus comprising an emission facet having a conductive surface, said conductive surface having an aperture therein,

said conductive surface including at least one protrusion extending into said aperture.

20. A near field optical apparatus comprising a conductive plane having an aperture therein, said aperture including a plurality of spaced apart slots, and at least one connector region joined to each adjacent said transverse slot.

21. The near field optical apparatus of claim 1, wherein said aperture comprises:

(a) a first slot of length L_1;

(b) a second slot of length L_2; and

(c) at least one connector region of width W, said connector region joined to said first slot and said second slot.

22. The near field optical apparatus of claim 21, wherein said length L_1 of said first slot is equal to said length L_2 of said second slot.

23. The near field optical apparatus of claim 21, wherein said first and second slots each have a width equal to said width W.

24. The near field optical apparatus of claim 21, wherein said connector region is centrally located with respect to said first and second slots.

25. The near field optical apparatus of claim 21, wherein said connector region is asymmetrically located with respect to said first and second slots.

26. The near field optical apparatus of claim 23, wherein said length L_1 of said first slot is greater than said width W, and said length L_2 of said second slot is greater than said width W.

27. The near field optical apparatus of claim 23, wherein said length L_1 of said first slot is equal to said width W, and said length L_2 of said second slot is equal to said width W.

28. The near field optical apparatus of claim 24, wherein said first slot includes a first end, said second slot includes a first end, and said connector region is positioned adjacent said first ends of said first and second slots.

29. The near field optical apparatus of claim 24, wherein aperture comprises a first connector region and a second connector region, said first slot includes a first end and a second end, and said second slot includes a first end and a second end, said first connector region positioned adjacent said first ends of said first and second slots, said second connector region positioned adjacent said second ends of said first and second transverse slots.

30. A semiconductor laser apparatus, comprising:

(a) a laser active region;

(b) a first reflective region adjacent a first side of said active region;

(c) a second reflective region adjacent a second side of said active region;

(d) an emission face proximate to said first reflective region, said emission face including a reflective, conductive layer thereon; and

(e) said emission face including an aperture extending through said reflective conductive layer and into at least a portion of said first reflective region, said reflective conductive layer including at least one protrusion which extends into said aperture.

31. The semiconductor laser apparatus of claim 30, wherein said aperture is smaller than a guide mode of said semiconductor laser.

32. The semiconductor laser apparatus of claim 30, wherein said first reflective region and said second reflective region each comprises a plurality of distributed Bragg mirrors.

33. The semiconductor laser apparatus of claim 32, wherein said semiconductor laser includes a first area under said aperture, and a second area

surrounding said aperture, said first area under said aperture including a smaller number of said distributed Bragg reflector mirrors than said second area surrounding said aperture.

34. The semiconductor laser apparatus of claim 33, wherein said first area under said aperture defines a region of lower reflectivity and said second region surrounding said aperture defines a region of higher reflectivity.

35. The semiconductor laser apparatus of claim 30, further comprising a semiconductor contact layer positioned between said reflective conducting layer and said first reflective region.

36. The semiconductor laser apparatus of claim 35, further comprising an oxide layer positioned between the reflective conducting layer and said semiconductor contact layer.

37. A semiconductor laser comprising:

(a) a laser active region;

(b) an first conductivity type upper reflective region adjacent an upper side of said active region;

(c) a second conductivity type lower reflective region adjacent a lower side of said active region; and

(d) an emission facet adjacent said upper reflective region, said emission facet having an aperture therein, said aperture smaller than a guide mode of said semiconductor laser, said aperture extending into at least a portion of said upper reflective region.

38. The semiconductor laser of claim 37, further comprising a reflective conductive layer on said emission facet.

39. The semiconductor laser of claim 38, further comprising a semiconductor contact layer located between said reflective conducting layer and said first conductivity type upper reflective region.

40. The semiconductor laser of claim 39, further comprising an oxide layer located between said reflective conducting layer and said semiconductor contact layer.

41. The semiconductor laser of claim 37, further comprising a first, lower reflectivity area under said aperture, and a second, higher reflectivity area surrounding said aperture.

42. The semiconductor laser of claim 41, wherein said first conductivity type upper reflective region comprises a plurality of p-doped quarter wave layer

pairs, and said second conductivity type reflective region comprises a plurality of n-doped quarter wave layer pairs.

43. The semiconductor laser of claim 42, wherein said first, lower reflectivity area under said aperture includes a smaller number of p-doped quarter wave layers than said second, higher reflectivity area surrounding said aperture.

44. The semiconductor laser of claim 38, wherein said reflective conductive layer includes at least one protrusion which extends into said aperture.